Warm Up
1. Sketch a graph of a polynomial function of degree 6, max # of turning points, with 4 real zeros and a negative leading coefficient.

2.Sketch a graph of a polynomial function of degree 5, max # of turning points, with 1 real zero and a positive leading coefficient.

7-6 Rational Zero Theorem

Solve, given that -4 is a zero.
$x^3 - 11x + 20 = 0$

$$\begin{array}{r|rrr} -4 & 1 & 0 & -11 & 20 \\ & & -4 & 16 & -20 \\ \hline & 1 & -4 & 5 & 0 \end{array}$$

$x^2 - 4x + 5$

$$\frac{+4 \pm \sqrt{16 - 4(1)(5)}}{2}$$

$$\frac{4 \pm 2i}{2}$$

$\{2 \pm i, -4\}$

Rational Zero Theorem-- $\frac{p}{q}$ is a possible zero, where:

- p ∈ set of integral factors of the constant
- q ∈ set of the integral factors of the leading coefficient

Solve
$0 = 6x^3 + 7x^2 - 9x + 2$

$p \in \{\pm 1, \pm 2\}$

$q \in \{\pm 1, \pm 2, \pm 3, \pm 6\}$

$\frac{p}{q} \in \{\pm 1, \pm \frac{1}{2}, \pm \frac{1}{3}, \pm \frac{1}{6}, \pm 2, \pm \frac{2}{3}\}$

$-2 \mid 6 \quad 7 \quad -9 \quad 2$
$\quad\quad -12 \quad 10 \quad -2$
$\quad 6 \quad -5 \quad 1 \quad ; 0$

$6x^2 - 5x + 1$

$6x^2 - 3x - 2x + 1$

$3x(2x-1) - 1(2x-1)$

$(3x-1)(2x-1)$

$x = \frac{1}{3} \quad x = \frac{1}{2}$

$\{-2, \frac{1}{3}, \frac{1}{2}\}$

Solve

$x^4 - x^3 + 7x^2 - 9x - 18 = 0$

$p \in \{\pm 1 \pm 2 \pm 3 \pm 6 \pm 9 \pm 18\}$

$q \in \{\pm 1\}$

$\frac{p}{q} \in$

$-1 \mid 1 \quad -1 \quad 7 \quad -9 \quad -18$
$\quad\quad -1 \quad 2 \quad -9 \quad 18$
$2 \mid 1 \quad -2 \quad 9 \quad -18 \quad ; 0$
$\quad\quad 2 \quad 0 \quad 18$
$\quad 1 \quad 0 \quad 9 \quad ; 0$

$x^2 + 9 = 0$

$x^2 = -9$

$x = \pm 3i$

$\{-1, 2, \pm 3i\}$

Do:

$0 = 2x^4 + 3x^3 + 6x^2 + 12x - 8$

$\{-2, \frac{1}{2}, \pm 2i\}$

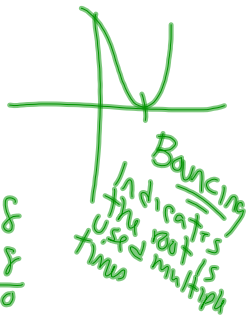
Solve.

$0 = x^4 - 4x^3 + 6x^2 - 8x + 8$

$p \in \{\pm 1 \pm 2 \pm 4 \pm 8\}$

$q \in \{\pm 1\}$

$\frac{p}{q} \in$



$2 \mid 1 \quad -4 \quad 6 \quad -8 \quad 8$
$\quad\quad 2 \quad -4 \quad 4 \quad -8$
$2 \mid 1 \quad -2 \quad 2 \quad -4 \quad ; 0$
$\quad\quad 2 \quad 0 \quad 4$
$\quad 1 \quad 0 \quad 2 \quad ; 0$

$x^2 + 2 = 0$

$x^2 = -2$

$x = \pm i\sqrt{2}$

$\{2, \pm i\sqrt{2}\}$

Solve.
$0 = x^4 - 6x^3 + 8x^2 - 48x$

Constant = 0
Factor GCF

$0 = x(x^3 - 6x^2 + 8x - 48)$

0

$p \in \{\pm1, \pm2, \pm3, \pm4, \pm6, \pm8, \pm12, \pm16, \pm24, \pm48\}$

$q \in \{\pm1\}$

6	1	-6	8	-48
		6	0	48
	1	0	8	0

$\{0, 6, \pm 2i\sqrt{2}\}$ $x^2 + 8 = 0$
$x^2 = -8$
$x = \pm 2i\sqrt{2}$

HW
p381
13, 15, 19, 25, 28, 30